THE

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Tic MAGAZINE

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WITH THE

COMPLIMENTS

OF

Mucostatics

This issue of TIC is devoted exclusively to Mucostatics because of the intense interest in the subject on the part of the dental profession. When TIC published pioneer articles on Mucostatics, beginning in 1942, few people paid attention. As time went on, an aroused interest brought us many requests for back issues covering articles by Dr. Wm. S. Dykens and Mr. Harry L. Page. Such copies have now become exhausted and we deem it expedient to house such articles under one cover to meet the popular demand.

Some confusion about Mucostatics has been brought to the minds of the dental profession by a few recalcitrants who have neophobia and who resent the fact that a layman adapted the old engineering principle of hydrostatics to prosthetic dentistry. These old timers are the hold-backs in dentistry and should be waived to the Congo where other primitive practices are in vogue. Such men even hate Roentgen.

Some dental manufacturers have, also, lent confusion to Mucostatics. One of these is a firm which has introduced a technique called "Muco-Seal." This technique has not the slightest thing to do with Mucostatics. Another is a firm which has introduced an impression material called "Mucostat." A pure Mucostatic impression gained from this material would be sheer accident. Yet, countless dentists have embraced such techniques and materials in the innocent belief that they are doing something about Mucostatics.

To date, there is only one way to learn Mucostatics for adaptation to private dental practice and that is to get clinical instruction. There is only one way to learn about the theory of Mucostatics and that is to attend lectures by those who have had extended practical experience with it or to read the ensuing articles in this issue of TIC by two authors who pioneered the subject and who have had more experience with it than any other living persons.

JAMES ROBINSON, *Editor.*

"The Sharp Explorer" by Shirley Webster will appear regularly after this issue. It is omitted this month for lack of space.

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Mucostatics

A PRACTICAL COMPARISON

By HARRY L. PAGE

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It has not been the failures, but instead, it has been the successes that have caused all the confusion and woes in prosthetics. When an empirical procedure turned out a certain percentage of favorable results, it became a "technique". Dentistry was led to believe, or else assumed, that it had only to follow a series of steps and its troubles were ended. Unfortunately, this came true with sufficient frequency to arouse enthusiasm and false hopes. Then, when the inevitable failures appeared, dentistry was nonplussed.

If the technique were labelled "scientific", confusion and bewilderment mounted. Having applied carefully every prescribed and so-called "scientific" step without results, there was nothing left to be done. The operator now found himself helpless. Then, in desperation, came the attempt with some other "technique" regardless of its claim to be or not to be scientific. When this succeeded (as it often did) where the first had failed, the vicious circle began all over again. Meanwhile, little if any, thought was directed toward the reasons why either technique should have succeeded or failed.

No technique is scientific. True science is exact and infallible. Technique is merely a manual exercise; our clumsy attempt to put a principle, or some principles, into practice. Not even the principles are scientific, being only deductions based upon theory, simple observation or upon such available and pertinent science as we know or can unearth and understand. Since we are human, we can only make mistakes so any scientific application would be a miracle. But, with failure as predominant as they have been in prosthodontics, it should be obvious that careful scrutiny of the principles upon which all techniques have been based is long overdue. Completely new principles have become imperative. It was a recognition of this need that created Mucostatics.

The Mucostatic principle is now recognized generally by the profession but it is still far from being understood. Because all previous training has been concentrated on technique, the full import of the principle is retarded by an almost universal desire to want it reduced to a routine, step by step method; some "standardized" procedure that is expected to solve all problems. Dealing with variables, as it does, edentulous prosthesis will never achieve an inflexible method and Mucostatics makes no attempt to do so. It is not a technique. Instead, it is a study in forces, causes and effects leaving the operator scope in which to exercise his native mental and physical skill in the practical application.

While proof will be given from sciences bearing upon the problem, what follows will show that the solution to impressions can be reached by a simple analysis of what is happening under present, standard procedures. Furthermore, it will be seen that "technique", as such, has had little to do with the successes. Instead, unalterable, natural forces have usually combined to produce a result not because of but in spite of what has been done.

Repeatedly, for example, where the success of a lower denture "technique" is attributed to the depth, detail or outline form of the lingual flange, the detail and form have been changed deliberately or the depth largely removed from the successful denture itself. Where it has made any difference at all, that difference was an improvement so it is obvious that these empiricisms were not the cause of success.

Suppose the same case be given to two clinicians; one who is an advocate of "tissue compression" or "functional tissue position" by stress and another who follows the precepts of Mucostatics. In certain types of cases, it will be found that the results secured are identical.

The very fact that two diametrically opposed methods can secure the same result on the same case should have incited an investigation leading to the solution in all cases. Yet, in the rejoicing over a satisfactory result, there seems to have been little disposition to seek the basic reasons for that success. Mucostatics, on the contrary, has been a constant inquiry into reasons with only an analytical interest in the mechanical steps or expedients employed. To argue against success, no matter how achieved, is foolish. The paramount objective is an understanding of what caused it, thus becoming conversant with such principles as will make a repetition of that success commonplace.

The clinician who employed Mucostatics certainly did not "compress" tissue, so it is logical to question whether the stress impression clinician actually compressed tissue. In order to find out, we must first know the composition of tissue. Unless

one does know the components of tissue and their bulk moduli; that is, how much pressure is required to cause unit compression of one component unit, then he is not qualified to discuss with authority the subject of "tissue compression".

Turning to physiology, it appears that all tissue resolves itself into two main components; water and solids. Soft tissue, we learn further, is predominantly water. By checking the bulk modulus of each solid involved, it is found that these are all less compressible than water. Water, then, is not only the predominant component but is also the most compressible. Therefore, we need but determine how much pressure would be required to cause unit compression of water and compare this with the load used by the advocate of a stress impression to find our answer.

As may be verified from hydrostatics, the bulk modulus of water at body temperature is 47 x 10-b. This means that 14.7 pounds of pressure will compress one cubic inch of the most watery tissue not more than .000047 of its volume. Therefore, if the clinician used thirty pounds of impressional pressure on one inch of the softest tissue, he could not "compress" it more than .000094 of its volume approximately. Not even the electron microscope is capable of completely recording this infinitesimal amount of compression so it is clear that the stress impression, from a practical viewpoint, caused no more "tissue compression" than did the Mucostatic impression and the term "tissue compression" should be deleted from prosthetic language. Thus, we have one reason why the results are identical.

It is the essence of the Mucostatic principle that there shall be no tissue displacement in taking the impression. It is, then, logical to determine just how much tissue displacement was caused by the stress method in this case. Physics teaches that, when two bodies press together, the weaker must give way. Instantly, the question arises, "Were the tissues in this particular case, by any chance, stronger than the stress employed?"

Checking the ridge, we find very hard, dense tissue. Compared to the impression material as used in the stress method, the ridge tissues are more resistant, so it must have been the material that gave way. Examination of the two impressions shows them to be so much alike, in spite of the difference in methods, that the tissue displacement in one was no greater than in the other.

Paradoxical as it may seem, here are two Mucostatic impressions obtained by diametrically opposed methods. It is as though we were taking an impression on a steel bar. This can be done by pounding lead around it or by allowing water to freeze around it and the results are exactly the same. Thus, we have a final reason for that identical result.

All this, however, does not justify a conclusion that these opposed methods should produce the same results in all cases for experience tells a different story. It becomes important to discover the reason for such different results.

Suppose we give the two clinicians a different type of case, one where the ridge tissues *are* susceptible to displacement under a stress impression. In this instance, the Mucostatic impression is found to remain steady on the ridge while the stress impression floats upward as soon as finger pressure is removed. A comparison of the two impressions shows them to be not at all alike. Since the Mucostatic impression did not displace tissue while the stress impression did displace tissue, it would appear that the tissue displacement has something to do with the floating tendencies of the latter. We could jump to the broad conclusion that the displaced tissue has forced the impression away from the ridge by pushing against it. This, however, is not enough. It is required that we determine whether tissue can actually do this and, if so, whether it is a significant factor in impressions generally.

Hydrostatics and aerostatics show that fluids are the only perfect elastics known. Elasticity, as may be verified from any common dictionary, does not mean the ability to stretch. It means that the substance has the ability to resist deformation but, once having been deformed by an external force, still has the ability to return to normal form, position or volume when the distorting force is removed or reduced. Since the water in tissue is a fluid, then tissue *is* elastic and *does* possess the power to resist deformation and to return to normal. Furthermore, tissue

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Keep your face always turned toward the sunshine and the shadows will fall behind you.
— *The Volunteer*

When you break your word, you break something that cannot be mended.
— *Durham Life's News Record*

An acquaintance that begins with a compliment is sure to develop into a real friendship.
— *The Agency Builder*

is alive and is possessed of an individual and relatively permanent shape. Anything that is both elastic and alive will absolutely refuse to remain passive in an abnormal position. Instead, it will fight to regain and maintain its normal form. In general, then we can come to the conclusion that it is not good practice to distort tissue lest its inherent powers of recovery unseat the appliance and leave us with a floating denture. But, this is still not the end of the problem.

Suppose the soft tissues in the case are displaceable by a stress impression but the impression does not float. Obviously, there is some force holding the impression in place that is strong enough to overcome the natural tendency of the tissues to fight their way back to normal. A retention must have been secured against which the distorted tissues in this case are helpless. As a usual rule, such a case soon loosens and in a few days or even hours, it, too, becomes a floater. To understand how this can happen is the next step.

Until the advent of Mucostatics, atmospheric pressure and the so-called "peripheral seal" were given credit for denture retention. The "peripheral seal" will be recalled later. At present, we are concerned with the failure of atmospheric pressure to maintain retention in the case just described.

It is a biological fact that tissue, confined for any length of time in a distorted position will resorb to and assume that position permanently. If atmospheric pressure were the retentive factor with enough power to retain the denture against freshly distorted and, therefore, strongly resistant tissue, then it should be even more effective as the tissue gives way to the denture base shape and the forces of tissue recovery become weaker. There is no change in the denture base area upon which atmospheric pressure is working so this is not a contributing factor. Yet, in a short time, the appliance has become a floater. This forces us to seek an answer in some other field.

Again turning to hydrostatics, we learn that the retention between two closely fitted objects with a fluid film between them which is exactly the condition obtained in dentures, is not caused by atmospheric pressure. Instead, it is caused by interfacial surface tension.

Surface tension is a powerful force and that power is inversely proportional to the thickness of the intervening fluid film. The thinner the film,the greater the retention. This can be shown readily by contacting two fitted glass plates with moisture between them. There will be a moderate retention against direct separation. But, when these same two moistened plates are forcibly pressed together, thus thinning the intervening film, the retention is increased enormously.

Surface tension is not affected by atmospheric pressure or its changes. This is demonstrated by suspending two retentive plates having an unbroken moisture film between them in a vacuum chamber. They will exhibit the same or even greater retention.

Surface tension shows its greatest power when the separation movement is at right angles to the film but has no power when the movement is parallel to the film. Moistened plates that refuse direct separation will still slide freely upon one another when not hindered by friction.

Surface tension power is seriously impaired and will shortly be destroyed entirely if the film borders are kept in contact with or are submerged in certain liquids. Moistened glass plates that are suspended in water will quickly fall apart.

Now we can see why the denture with an initial retention became a floater after a short interval. Force and the stiffness of the impression material wiped and squeezed all the moisture from the tissue surfaces when the impression was taken. The resultant film, being very thin was, at first, exceedingly powerful. But, as the tissues resorbed to assume the form imposed upon them by the stress impression and denture base, the film thickened correspondingly with consequent loss in power. When its retentive force became less than the opposed powers of tissue recovery, the tissue moving parallel to the base and, therefore, moving with comparative ease, returned to normal position and unseated the appliance.

But, we have not yet arrived at the full solution for there are types of cases where a certain amount of tissue distortion does not result in a floating denture and the case continues to be retentive and successful. By simple observation, such cases show that the tissues are either so flabby as to be incapable of reasserting themselves against the slightest retaining force (an extremely rare condition) or, what is fairly common, there are sufficient areas of dense tissue that were undistorted by the stress impression to maintain retention against attempted recovery by such soft areas as were distorted. Naturally, such retention continues to be effective after the soft areas have resorbed and complied permanently with the rigid, denture base shape. This, however, is no reason to advocate pressure. Standard practice has shown that the odds against success are too great. In addition, we are causing necrobiosis and necrosis of the ridge.

Necrobiosis and necrosis of ridges are so commonplace under the stress type of impression that the profession takes it for granted that this is inevitable

under any type of impression. This need not be the case for, barring systemic disturbances or trauma caused by malarticulation resorption is, for the most part, avoidable. Thousands of upper dentures made in the days when a soft plaster impression was the rule are still being worn after thirty or forty years with little apparent resorption.

Under a Mucostatic impression, the tissues are recorded in a contented position. Furthermore, the impression complies with, rather than fights against their natural tendency to maintain that position by supporting them comfortably and immovably. Not being squeezed or tortured, there is no need for them to give way. They are not fighting to resume normal for they are already normal. While no accurate research has yet been made to prove that tissues do not give way eventually under a Mucostatic base, observation indicates that the ridges seem to remain in status quo indefinitely. And, now we come to the reasons why it is at all possible to secure stable or solid denture bases under any type of impression.

All advocates of the stress type of impression base their contention on the theory that soft tissue is forced into some "functional position" under an appliance when stress is put upon that appliance. Therefore, they strive to anticipate this in the impression. The very fact that no two stress impressions are alike, yet often show equal stability on the same case, should be enough to throw strong doubts on this theory. In addition, no application of stress in taking the impression, whether manual or functional, could ever duplicate all the varying stresses that the patient would exert in actual function. To assume that a universal stabilization point is reached under some arbitrary degree of stress that the patient or the operator may exert during an impression is nonsense on the face of it.

Suppose we were to conclude that the tissues under an appliance during functional stress did assume a shape different from that of those same tissues at normal and suppose we then follow that premise to its decidedly unpleasant conclusion. Since no volumetric change is involved, the most elementary reasoning reveals that the unchanging appliance base shape would be a total misfit against the constantly changing ridge shape at all times except when the degree of functional stress happened to coincide exactly with the arbitrary degree of stress used in taking the impression. Thus, it would be impossible to fit a denture base with ANY method and the prosthodontist might as well quit. The authority who insists that tissue gives, moves or changes form under appliance stress is only telling the world that his dentures do not fit.

All impressional stress methods are based on overall and bilateral tissue resistance whereas functional stress involves mostly localized and unilateral tissue resistance. Therefore, we can also see that if tissue did change form under appliance stress, the very methods used would be impotent to accomplish the avowed purpose. Add to this, the almost unlimited permutations involved in functional stresses and we are reduced to the conclusion that functional stress and some arbitrary impressional stress have about one chance in infinity of coinciding. The balance of the time (which means all the time) the appliance would be a vicious, ill-fitting instrument of ridge destruction. Consequently, we might as well inform all patients at the outset that it is but a question of time and their individual toughness until our dentures destroy their mouths. Bluntly stated, the situation existing since all types of stress impressions became popular is an uncomfortably close parallel. Fortunately, it is not necessary to work under such a premise. For proof, we return to hydrostatics.

When an external force is exerted upon a confined liquid, that force is dissipated instantly, undiminished and in all directions throughout the confined liquid. This is Pascal's law.

At the same time, resistances to that transmission are operating throughout the liquid in direct opposition to the forces created by the external load. So long as the external load and the internal resistances are unequal, movement must take place in the direction of the weaker. But, once the external load and the internal resistances are equal, a static condition obtains. Except under the tremendous loads required for compression (and compression has already been eliminated as a factor in prosthodontics), this static condition occurs the instant all surfaces of the confined liquid are in uniform contact with the walls of the containing vessel. Once the tissues of the ridge are in uniform contact with the confining walls of a denture base, the same phenomenon takes place.

Can anything be sadder than work left unfinished? Yes, work never begun.

— *The Agency Builder*

No person was ever honored for what he received. Honor has been the reward for what he gave.

— *Calvin Coolidge*

A simple illustration is afforded by a partially filled hypodermic syringe held in a horizontal position. The plunger moves the liquid readily until uniform liquid contact with the barrel and the plunger is established. At this point, resistance becomes severe, and if the needle opening be closed, the liquid becomes immovable.

Thus, we can see that, so far as resistance to a load is concerned, the position given soft tissues by an impression or denture base is absolutely immaterial once the base is brought into uniform contact with the tissues. But, to assume that the stabilization point is reached under some functional load completely overlooks tissue elasticity and life and the fact that tissue movement toward the weaker force is not a one sided affair. Whenever masticating stress is less than the stress assumed as maximum in the impression, there will be tissue movement toward the load with consequent appliance movement away from the ridge. The use of stress breakers on partials built to stress impressions is an unwitting admission of this.

Possibly some one will contend that Pascal's law applies only when there is complete confinement and that a denture base does not provide complete confinement of the tissues. Such a statement would fail to recognize the fact that tissue is intergumentary; it is already confined in its own mucous membrane. This being the case and no leaks being possible, another hydrostatic law applies; namely, that immobilizing one part of a liquid immobilizes it all. It moves as a unit or none of it moves. Soft tissue does exactly the same thing. Such a statement would also forget that if overall confinement of tissues by a denture base were a factor in Mucostatics, it would be just as much a factor in any other type of impression and none of them would be effective.

All of this can be demonstrated practically by watching the reactions of a distal extension or lingual bar lower where the impression has been taken under some form of stress. If we press on the saddle, it will go down slightly. But, it goes just so far and no amount of stress can force it further. Stabilization occurs the instant the rigid base has forced the soft tissues into uniform contact. Since the impression and the base are duplicates, this stabilization point is also the position given the tissues by the stress impression. But, the instant finger stress is removed, the saddle will be seen to move upward to its former position. Lower appliances do not leap into the air in defiance of the law of gravity. The tissue elasticity and life being stronger than the load as represented by the appliance alone, have moved the tissue toward the load and have unseated the appliance.

Since no two stress impressions are alike, yet all stabilize at the tissue position created by the impression, we can see that the "functional" or "masticating position" of tissue is *any* position wherein the appliance makes uniform contact with the tissues. Quite simply, this means that soft tissue is just as capable of immovably supporting a load when in its natural position as it is when forced into some other position. So-called "tissue resiliency", then, is merely the movement of an ill-fitting appliance as it goes down to seek uniform tissue contact under external stress, followed by tissue recovery lifting the appliance out of uniform tissue contact when that stress is removed or reduced. The term "tissue resiliency" may also be deleted from prosthodontics.

Advocates of stress impressions have contended that, under a Mucostatic base, a load on an appliance will force blood from the ridge capillaries and this will cause appliance movement. Such a contention forgets that if this were a factor in Mucostatics then it would be disastrous in a stress method. If stress on an appliance will force blood from the capillaries, then a stress impression will certainly do no less. Any denture base that duplicates such an impression and stays in place must not only repeat this blood removal but also perpetuate it. No imagination is needed to visualize just how catastrophic this would be, yet there seems to be no discussion of any such thing in prosthodontic records.

To see that this is not a factor in Mucostatics or any other type of impression should be simple. Even for one unfamiliar with hydrostatics, it should be clear from the single fact that tissues do not compress under an appliance. Only volumetric decrease of ridge tissues can cause blood removal. A comparison with the result when finger stress is applied to free tissue is silly. One might as well put his finger in a pan of water and from the observable liquid displacement, condemn the hydraulic brakes that stop his car so faithfully.

For anyone familiar with hydrostatics, an additional explanation can be made. The circulatory system is closed like any pipe line. The venous and arterial systems have identical cross sectional areas while the capillary bed has a total cross sectional area ranging six to eight hundred times greater. This tells him instantly that it would require an appliance load from six to eight hundred times blood pressure to have the slightest effect on capillary blood.

If we assume a blood pressure of 120 millimeters HG, then a masticating force ranging from 1380 to 1840 pounds per square inch would be required just to balance heart pressure. Given 140 millimeters HG and masticating force must be from 1860 to 2480 pounds. And we have not even considered inertia, flow resistance or valvular regulations in the main blood streams, all powerful factors in our favor.

With forces of this magnitude involved, we need worry ourselves little over the effect of twenty pounds in mastication.

Once it is understood that a denture base is stable the instant it is in uniform contact with tissue regardless of tissue position, and that the real problem is to prevent distorted tissues from returning to normal and unseating the appliance, the conclusion becomes inevitable.

Since the only position from which tissue makes no attempt to return to normal is an already normal position, lasting stability demands AN IMPRESSION AND DENTURE BASE THAT ARE ABSOLUTELY ACCURATE NEGATIVES OF THE RIDGE TISSUES IN THEIR NORMAL, PASSIVE FORM. This is the basic Mucostatic Principle and it has never failed to produce a stable denture base. And, as we come to the subject of retention, the principle is found to be equally sound for unless we can keep the base in uniform contact with the tissues, retention is an impossibility. When distorted tissues in returning to normal unseat an appliance, it no longer fits and all retention is destroyed.

It has already been noted that the retentive factor in dentures is not atmospheric pressure but, instead, is interfacial surface tension. One example has been given where atmospheric pressure, with everything working in its favor, failed to maintain retention. Suppose we consider another.

It is commonplace to hear that water in a patient's mouth causes a lower denture to lose retention. It is every day practice to loosen highly retentive upper impressions by flooding the borders with water. If atmospheric pressure were the retentive factor, then there should be no change in its effectiveness under these circumstances. And, if there were such a thing as a peripheral seal, then an added water seal should increase its powers tremendously. Yet, it works just the opposite.

One denture authority, in discussing the effect of water on retention (which he attributes to adhesion and cohesion) states that water so reduces the specific gravity of saliva that its cohesive qualities are destroyed. That the cohesive qualities of saliva would be reduced if its specific gravity were *materially* reduced, is correct. He then goes on to give the specific gravity of normal saliva as 1.003 but he does not give the specific gravity of water. In its pure state this is 1.000 although it varies slightly with temperature. Ordinary drinking water often contains impurities that raise its specific gravity close to, or even above, that of saliva. Consequently, it is hard to comprehend just how enough water could be introduced beneath a closely fitting denture base, or even in the entire oral cavity, to cause any appreciable lowering of the specific gravity of the saliva. And how would this theory apply to the fact that excess saliva, itself, around the appliance will also destroy retention?

To discover how water can loosen dentures and impressions, we return to the peculiarities of surface tension. We recall that the power of surface tension is soon destroyed when the film borders are kept in contact with or are submerged in certain liquids. Briefly, what happens is as follows. All along the border of the film there is a microscopic meniscus, a half circle of film, always curving inward. This half circle is trying to reduce itself to a complete circle and, in so doing, will hold together objects caught in its sphere of influence. When a liquid from the outside contacts this meniscus, it immediately reverses its form to that of a straight line that tends to thrust the two objects apart.

The action and reaction may be observed by floating two needles about an inch apart on water. The intervening meniscus will quickly draw them together. Then, if a drop of water be introduced delicately upon the meniscus between them, the needles will spring away from each other but will return to intimate contact as soon as the disturbing influence is gone.

When water is flooded along the borders of a denture or impression, the same phenomenon occurs. An active repulsion takes place between the appliance and the tissues. When the water is removed, as by swallowing, the meniscus resumes its former position and retention is regained.

This makes it clear that saliva is not the friend but, instead is the deadly enemy of retention. To an even greater degree, this is true of liquids taken into the mouth in the form of food and drink. Many of these have surface tension coefficients far below that of saliva. Therefore, their effect on retention can be, and often is, very serious. The alcohol in whiskey, the acetic acid in lemon juice and vinegar are good

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The man who watches the clock usually remains one of the hands.

— *Advertisers Digest*

The man of the hour spent many days and nights getting there.

— *Durham Life's News Record*

examples of this. The surface tension of alcohol, for example, is about one fourth that of saliva.

The clinician, in exhibiting the retention of a lower denture, is wont to ask the patient to bite and forcefully swallow just before making his demonstration. It was thought that this act created a vacuum under the appliance. What actually happens is that the patient, in biting, thins the moisture film between the denture and the tissues thus increasing its power. At the same time, he swallows any excess saliva or liquids that surround the denture borders and removes their threat to the retentive power of the film.

Such a demonstration, while it may be spectacular, has not the slightest value. It is merely an exhibition of momentary, mechanical retention under the most favorable circumstances. Functional retention is an entirely different affair and it is functional retention in which the patient is interested. If we are to understand and perfect functional retention, it is in this field that we must study for many a denture that can scarcely be pulled from the mouth in a clinical demonstration, fails miserably in function. Conversely, dentures that demonstrate no mechanical retention at all remain immovable during function.

The answer will not be found in any depth, detail or outline form of the lingual flange. The fact that two clinicians, given the same case, will construct diametrically opposed lingual flange outlines and both dentures will have identical retention is sufficient proof of this. That the lingual flange is powerless to aid retention is due to the fact that any separation movement finds the lingual flange moving parallel to the lingual wall of the ridge and it has already been shown that surface tension has no power against parallel movement. If this were not so, we could not have a high speed motor bearing or even an ordinary wheel. It is the ridge surfaces that are flat or that tend to be flat that provide retention.

We cannot rely on the "peripheral seal", nor need we be worried over a "peripheral leak". Neither can exist where two fitted surfaces are involved. There must be at least a partial vacuum inside the periphery to make either one a factor and no vacuum is to be found under accurately fitted dentures. On the contrary, there is usually compressed air under a denture base striving to get out, so a "peripheral seal" would be a detriment while a "peripheral leak" would be an aid, provided there were any such things in denture prosthesis.

Two statements have been made persistently in support of the atmospheric pressure theory. One calls attention to a momentary sensation of pain as the upper appliance is pulled away. It would make no difference whether the retentive agent were atmospheric pressure or surface tension or even magnetism for there would be the same sensation. The other states that the dentures of flyers come loose at high altitudes. Those who use this in support of the theory are apparently ignorant of the fact that some dentures tighten at high altitudes. Whether they loosen or tighten, atmospheric pressure is not the direct cause. It has been known for centuries that live bodies swell under reduced pressures. Divers' lives depend on recognition of this fact. Fish brought up from great depths have been known to explode upon reaching the comparatively mild pressure at the ocean's surface. This swelling releases or tightens a denture, depending upon the nonexistence or existence of mechanical locks.

The real answer to functional retention lies in neutralizing the deleterious effects of saliva and liquids introduced into the oral cavity. As an illustration, if the viscosity of the saliva were increased, retention would be enhanced. Sugar or salt solutions will do this to some extent. Commercial powders are effective simply because they form a viscous jell upon contact with saliva and because surface tension power is increased by an increase in viscosity. For this reason, a ropy saliva is preferable to a thin, watery saliva. But, no matter how the problem may be approached, these are the forces with which the prosthodontist must contend in maintaining retention and all the tolerable, empirical expedients that man can devise mechanically never have been or ever will be a satisfactory answer.

Next, we come to border tissue freedom. When the almost universal practice of "muscle trimming" is put under the glass, the first thought that should have occurred to the anatomist is that there are no muscles on either the maxillary or mandibular ridges. We do find tendons and an occasional apponeurosis but these are attached, not to the mucosa, but to the periosteum on the ridge side. They do not affect the mucosa, are no different from the frena and may be by-passed in the same way. Bearing in mind that immobilizing one section of tissue immobilizes the whole, then the converse must be true; namely, disturbing one section of it disturbs it all. Manual "muscle trimming", therefore, is merely a ridge distorting agent for tissue will no more stretch than it will compress.

If a finger be inserted in the mouth and cheek be pulled aside ever so gently, connected tissue all along the ridge will be seen to move. Consequently, any impression "technique" that requires finger manipulation of material while in the oral cavity will do the same thing. If "muscle trimming" or the introduction of the fingers into the mouth cause ridge distortion, then it is clear that both must go into the discard.

The question of denture outline has plagued the profession from the outset. There is a disposition to feel that, if the impression appears successful, then the denture outline must follow the impression outline to a hair's breadth or the case will be ruined. It is but necessary to contemplate the thousands of successful dentures to see the fallacy in such thinking. There could be only one outline for any given case that would succeed.

No matter how carefully a case may be processed, it would be a miracle if the finished outline corresponded exactly to that of the impression. Two cases for the same mouth never have identical outlines. Then, there are the innumerable cases where the outline has been trimmed on the denture because the patient complained of interference, yet there was no change in either stability or retention. The various outlines advocated by various techniques and all producing stable and retentive denture bases in many cases are further proof that outline form and detail have no value except to indicate the amount of coverage desired.

So far as stability is concerned, we need but return to the hydrostatic principle that immobilizing one section of ridge tissue will immobilize it all. So far as retention is concerned, let us take two fitted glass slabs with a retentive film between them. If one be broken and a part be removed, the remainder will continue to be proportionately retentive. Yet, the original outline is gone.

Comfort is another source of constant trouble that is largely needless for the solution is relatively simple. The amount of effort that is concentrated on what can only be futile efforts to "relieve" denture bases and the paucity of thought directed toward isolating and teaching the actual causes of discomfort are almost unbelievable. Repeatedly, for example, soreness could have been avoided by an X-ray that would have revealed underlying cancellated bone that should have been removed. No mouth can be comfortable when tissue is caught between jagged bone and a pressing appliance.

Overextended borders are another common cause of discomfort. Since neither stability nor retention are dependent upon forcing borders into soft tissue, this could have been obviated for the most part in the original outline. The very fact that the reduction of irritating borders is a daily occurrence in almost every office tells the story.

Now, we come to the cause of discomfort that, in spite of everything that has been said and written on the subject, is seldom understood and is, still, the most prevalent. It is faulty articulation. This is not a discussion of articulation so there will be no attempt to do more than make a few observations. It is discouraging to find that an impression method is expected to produce denture bases with permanent comfort and utility under the most obvious malarticulation. And, again, the cry is for an empirical routine that will solve all problems. It may as well be understood that until sound principles are taught and clearly comprehended, successful technical steps in articulation may not even be discussed. It is unfortunate that the profession has only one articulation method (Gnathology) that is sound in principle.

Many dentists follow no recognized articulatory method at all. Others conform to the most studiously evolved and scrupulously applied methods. But, regardless of the wide divergence between these methods, the results, honestly reviewed, are the same. Innumerable cases where there has been no effort to establish "centric" perform splendidly while others, upon which the most ingenious schemes and devices for obtaining "centric" have been employed, cause only misery. This welter of contradictions alone challenges an investigation leading to the real solution. Meanwhile, it may as well be recognized that such successes as are achieved transpire, not so much because of but rather in spite of what has been done.

We can be assured that ridge discomfort is an unmistakable and undeniable indication of faulty articulation. It will avail nothing to make a so-called "relief" in the base. No well fitting base can cause soreness by itself. It is the twisting, grinding forces caused by tooth and cusp misalignment transmitting adverse leverages through the base to the tissues that create pain. This is clearly indicated by the fact that grinding a base for relief seldom results in anything more than chasing the sore spot all over the ridge. Meanwhile, all the work done in the impression is being ruined. On the other hand, the pain disappears like magic when the articulation is corrected.

It must not be assumed that this correction will be accomplished by so-called "balance". To conclude that a case is properly articulated because the

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Blessed is the man who is too busy to worry in the daytime and too tired to lie awake at night.
— *Peoria Ad Clubber*

Nobody knows the age of the human race, but everyone agrees it is old enough to know better.
— *Gulf Stream*

teeth can glide freely while maintaining even contact at three or even thirty points is patently fallacious. If it were this simple, flat teeth would never fail and the bulk of the cusp teeth would never succeed. The instant a bolus is interposed, all such "balance" is destroyed.

The answer does not depend upon what "type" of tooth is used as results in everyday practice clearly demonstrate. One dentist will insist that a certain type of tooth causes him "less trouble" while a colleague will insist upon exactly the reverse. Neither of them will say that his choice of tooth solves his problem completely. The net deduction can only be that neither one is a true solution.

That the "gothic arch tracing" is a fallacy should be apparent from simple geometry. The same applies to "grinding in" of occlusal planes in the mouth or the "milling" of teeth either in the mouth or on an articulator. As McCollum has so clearly demonstrated, "Teeth do not wear into occlusion; they only wear out of occlusion." Daily observation should have made this apparent to the denture authority long ago from what happens to natural posterior teeth. Supplied with the perfect grinding mechanism, the patient's own, they wear themselves into traumatic malocclusion and are lost.

No matter what articulation method is used or recommended, if it leaves the patient with a painful denture, it is *not* the answer. Meanwhile, the important lesson is full realization that POOR ARTICULATION IS THE MAIN CAUSE OF PAIN and that grinding the contact surface of a well fitting base is NEVER of value.

Before concluding the discussion of impressions, some consideration is due the so-called "no pressure" impression. It is growing steadily in favor and deservedly so. To the discerning, it is a logical stepping stone to Mucostatics, for, while satisfying the current demand for a routine "technique", it is constantly approaching the Mucostatic Principle. As it reaches its ultimate form, the "no pressure" method will gradually evolve into Mucostatics itself. At the same time, the term "no pressure" will disappear for pressure or lack of pressure plays no part in this type of impression. Pressure can come from many sources other than manual. "Muscle trimming", the mere presence of fingers in the patient's mouth, heavy or bulky or overextended or closely fitting trays, tray stops, unsuitable impression materials, separating media, post-dams and the great incalculable hydrostatic pressure—all produce the effect of pressure just as readily as deliberate forces applied directly by the hands.

And now, one final hypothetical example that will blanket the whole subject. Suppose an ardent advocate of some form of stress impression has built a case that continues phenomenally successful for two or more years. How this can happen has already been explained. It being the essence of his belief, he must admit that the impression forced the tissues from their natural position. Since they have been held in that position for two or more years, he must also admit that they have assumed that position permanently. Therefore, it has now become their natural position. At this point, the patient loses his dentures.

Being a careful prosthodontist, the dentist has preserved the master models from which the case was constructed originally. What shall he do? Shall he reenter the mouth and, following his usual method, force these tissues into a new and unproved position or shall he construct the new case from the old models, thus leaving the tissues in the position that has proved so eminently successful? Plain, common sense dictates the latter course. With this decision, he has denied his own principle and has, in effect, taken a Mucostatic impression.

Harry L. Page
Suite 1625,
25 E. Washington St.
Chicago, Ill.

A pessimist is one who sizes himself up and then gets sore about it.

— Durham Life's News Record

The reason I beat the Austrians is, they did not know the value of 5 minutes.

— Napoleon

Economy has been defined as a way of spending money without getting any fun out of it.

—The Houghton Lind

The man who wakes up and finds himself famous hasn't been asleep.

— The Agency Builder

Ideas are more significant than facts, because ideas bring facts into existence.

— A. M. Lederer

Page Mucostatic Impressions

NOT A TECHNIQUE, BUT A NEW THOUGHT IN BASIC PRINCIPLES

By WM. R. DYKINS, D.D.S.

One year has passed since Harry Page introduced the Page Mucostatic Impression System in the East and it is very appropriate that some kind words were pronounced by the profession in regard to the Page Mucostatic System. To those of us who were fortunate to study with and learn by Mr. Page's ideas, it has truly been a blessing, especially on those badly recessed mandibles.

Some of the Mucostatic principles are not entirely new to the profession. Drs. Hall, Stansbery, Brock, Colburn and, doubtless, many more have employed the idea of an impression without pressure which is part of the stabilization principle of Mucostatics. Dr. G. H. Wilson, in the 1916 edition of his "Dental Prosthesis," noted the fallacy of atmospheric pressure in denture retention. He wrote:

> "It is a physical impossibility to exclude the film of air between the soft tissues of the mouth and the hard base plate except by substituting a fluid for the film of air. By the substitution of this fluid for the film of air the law of hydrostatics is introduced.[1] The law of hydrostatics is that pressure placed upon a confined liquid is equal in every direction.[2] Therefore, a mechanically perfect adapted denture, having a fluid contact, cannot be retained by *atmospheric pressure*, because the intervening fluid equalizes, within and without, the *atmospheric pressure*."

[1]The law of hydrostatics states that liquids are incompressible except under tremendous loads, soft tissue being approximately 80% liquid therefore is incompressible.

[2]Pascal's law states that any liquid or semi-liquid when enclosed in a rigid container takes on the same shape and rigidity of the container.

From these two laws, two facts stand out.

1. No distinction need be made between hard and soft tissue.
2. If pressure or no pressure is used in taking the impression, stability is obtained only when the base completely contacts the tissue.

Dr. Wilson inclined to the belief that adhesion, cohesion, or both, were the retentive agents. In many cases these, as well as capillarity, are fairly close synonyms for surface tension which was shown by Page to be the real retentive factor.

Surface tension is one of the most powerful forces in nature and operates by virtue of a thin moisture film between two closely fitted surfaces, such as two sheets of evenly ground glass (Fig. 1). This tendency operates in a vacuum as well as under normal conditions (Fig. 2). Atmospheric pressure has nothing to do with retention. The retentive factor is fluid surface tension.

Surface tension is inversely as powerful as the thickness of the film and is independent of atmospheric pressure. Its power is seriously impaired and, in a short time, destroyed entirely if its border meniscus is kept in contact with or submerged in similar liquids. Two flat slabs of glass in contact with each other, with a tiny film of moisture between them, will slide back and forth. Try to pull them apart at right angles to their planes. That is the simplest illustration of retention we can find—the surface tension of a film of liquid between two bodily surfaces.

Place those same slabs of glass in water and watch what happens. They come apart easily. (Fig 3). This illustration has a dental reference. Squirt water around the margins of a denture with good retention. If you then test for retention you will find that it has been lost. Yet that water is on the outside of the denture and not on the inside. Thus, an excess of saliva around the denture periphery will actually cause the surface tension film under the denture to reverse its action and repel the appliance from the tissues with consequent loss of retention.

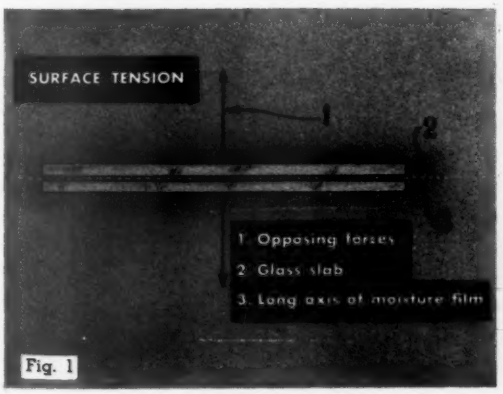


Fig. 1

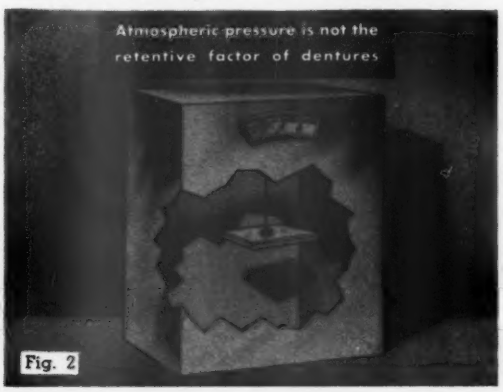


Fig. 2

What happens is easily understood when you watch the meniscus upon water in a glass. Pour water in a glass and you will notice that the surface is not perfectly level; the water curls along the edge of the glass. As water is added, the curl or meniscus, moves up all the time. Saliva, or water, around the edge of a denture also forms a meniscus. As the quantity of saliva or water increases, the meniscus rises and is transferred from the border of the denture inward to a point above the level of the liquid outside that border. When that happens the denture begins to lose retention. (Fig. 4).

Although Dr. Wilson recognized the dubious value of atmospheric pressure in denture retention, he failed to carry the idea to completion. In his next paragraph following the aforementioned, he tries to explain how atmospheric pressure may still be utilized to retain a denture through the medium of a vacuum chamber. The exhaustion of the air in this vacuum chamber is attempted by forceful swallowing on the part of the patient.

Swallowing, forceful or otherwise, could not create a vacuum under the appliance because any reduction in closed mouth pressure would apply equally both outside and inside the denture periphery. Retention is enhanced by swallowing because the act removes the excess saliva outside the denture borders. This allows the surface tension meniscus to return to its protective position at the denture borders and creates a thinner film under the appliance.

Why Wilson permitted the atmospheric pressure idea to confuse him is inexplicable. It remained for Harry Page to recognize the value of surface tension in denture retention and to apply it knowingly and successfully. In the controversy of atmospheric pressure versus surface tension time alone will prove which theory is correct.

With the Mucostatic System we obtain stability and retention in an impression or base without resorting to any tongue, lip or cheek gymnastics. Muscle trimming and extension for seal are ignored. Flat ridges are equal to and often better than high ridges for retention. They present a greater area in which to obtain surface retention (Fig. 5).

Heretofore obtaining stability was never too much of a problem regardless of the technique used in the impression. The basic difficulty with which we were always confronted was the prevention of lift of the denture. Our concept of lift troubles was denture outline and functioning musculature.

When we examine some of the better known techniques, it is apparent that there exists differences of opinion of what constitutes proper lingual outline. For instance, we have the advocates, who teach that the lingual flange should be extended to a contact depth of the floor of the mouth when the tongue is at its mid-low position. Then we have those, who say that the lingual flange should slightly penetrate the sub-lingual space and remain above the mylohyoid area. We also have those, who reverse the last

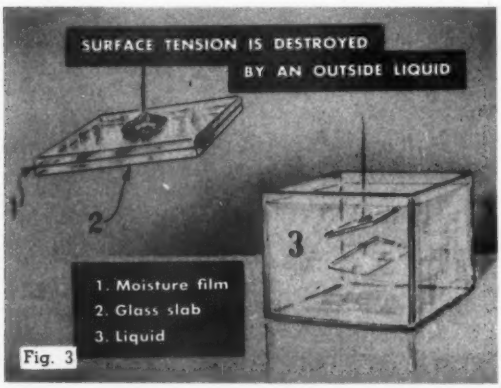


Fig. 3

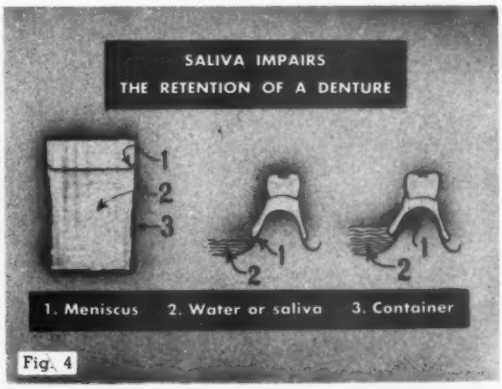


Fig. 4

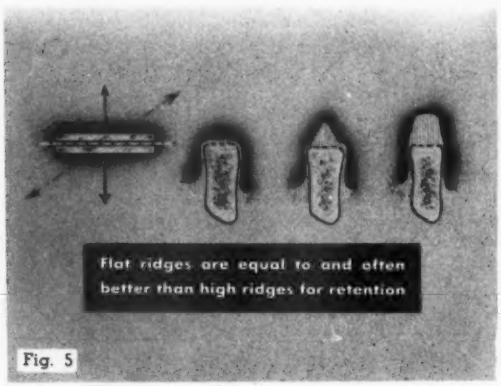


Fig. 5

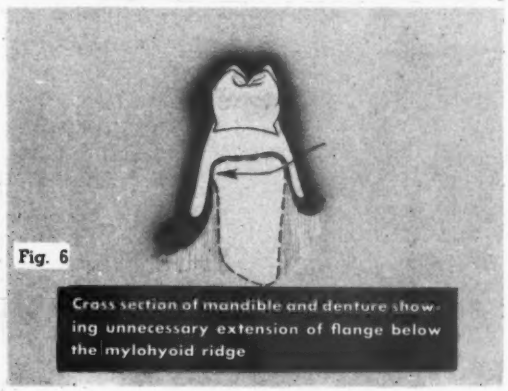


Fig. 6

mentioned procedure. (Fig. 6).

The extension of the lingual flange beyond the bone width is of little or no importance. All these techniques are successful temporarily (and I use the word temporarily advisedly), when the maximum power of surface tension is developed and the musculature does not offer too much resistance against the denture outline.

The only value the extension of the flange beyond the bone width has, is to give the base lateral stability and prevent movement. One or two millimeters is sufficient extension to prevent lateral movement. There are no muscles on the ridges except frenum attachments and their relief can be provided for; it is obvious that this base outline offers more freedom for muscle function.

A simple comparison relative to flange extension is the railway carwheel. Here the flange prevents the wheel from rolling off the track while the load is borne by the wheel and truck. The same principle holds true with dentures. It is the ridge which carries the load and not extensions into unsupported tissue beyond the bone width. (Fig. 7).

While he was not the first one to sense that it was a problem, Page was the first to actively teach us that when we used impression techniques that displaced tissue we were on the road to failure. (Fig. 8). He was the first to point out that tissue, being semi-liquid, was therefore, elastic. He also made it clear that elasticity does not mean the ability to stretch. It means the ability to return to normal form and position after having been forced out of shape. He showed that tissue, being both elastic and alive would, inevitably, fight to regain and maintain its normal form. When the force used to displace tissue is removed, the tissue resumes its natural position, thereby unseating the denture. (Fig. 9). If the tissue is forcibly held and cannot resume its natural position, it resorbs and the denture becomes unretentive for this reason

Since Mucostatics demands a highly accurate reproduction of the impression by the denture base, it was inevitably drawn to the proven accuracy of Ticonium bases, especially in those cases where intricate soft tissue detail must be scrupulously reproduced. In Ticonium we have a base material that faithfully records these all important details thereby promoting solid stability and the utmost in surface tension contact which later results in the extraordinary retention attainable with Mucostatics. (Fig. 10).

Another distinct advantage the Ticonium bases possess for Mucostatics is the thinness with which it may be processed at the denture borders. In Mucostatics this is most important. The average thickness of the metal at the periphery is less than a millimeter. This thinness permits the musculature to function unimpeded directly from its origin or insertion.

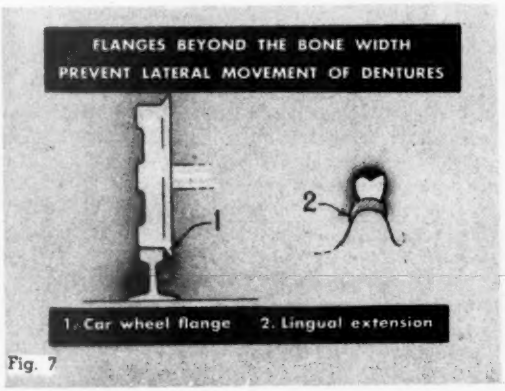
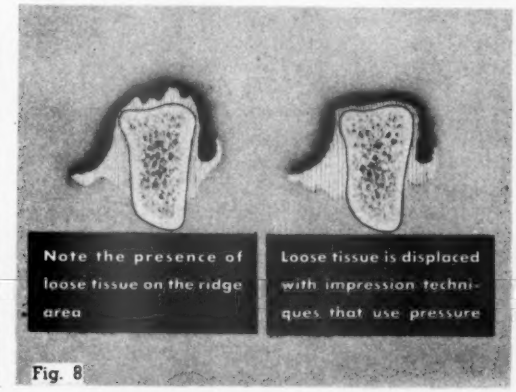


Fig. 7


Note the presence of loose tissue on the ridge area
Loose tissue is displaced with impression techniques that use pressure
Fig. 8

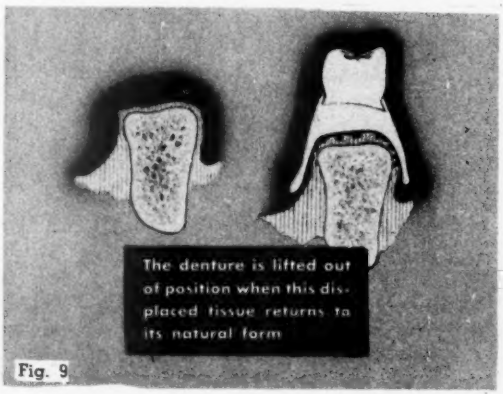
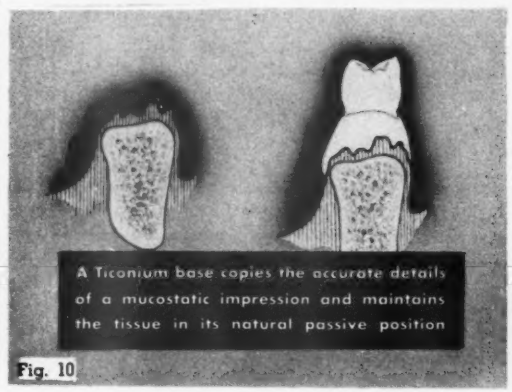


Fig. 9


A Ticonium base copies the accurate details of a mucostatic impression and maintains the tissue in its natural passive position
Fig. 10

Taking the fit for granted, this increased functional freedom, especially as applied to the tongue, is one of the first advantages noticed by the patient who acquires a Mucostatic base of Ticonium. By the same token the production of speech becomes automatically easier.

My opinions are based upon the successful results of some seventy odd cases.

One of the strongest characteristics of genius is the power of lighting its own fire.

— *John Foster*

Justice remains the greatest power on earth. To that tremendous power alone will we submit.

— *Harry S. Truman*

Stability

AND THE PAGE MUCOSTATIC PRINCIPLES

By **WILLIAM R. DYKINS, D.D.S.**

Denture stability is defined as the ability of an appliance to remain steady for all practical purposes under functional crushing loads or their components.

The basis of denture base stability is found in the fact that tissue is incompressible and in Pascal's Law, which states that when a force is exerted upon an enclosed liquid, that force is transmitted undiminished in all directions throughout the liquid. A supplemental fact of this law is that any liquid or semi-liquid, when enclosed in a rigid container, takes on the same shape and rigidity as the container.

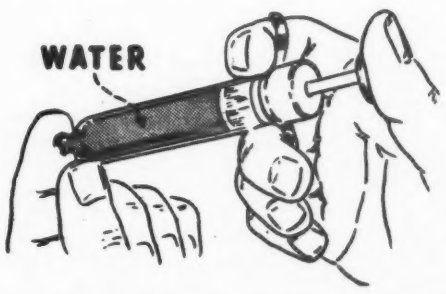
A study of these facts will explain why, regardless of the method used in obtaining the impression, we are able to obtain stability. We obtain stability *whenever* the base is in uniform contact with the tissue, whether the tissue is forcibly made to contact the base, or whether the base is made to fit the tissues in their normal passive position. But, only a study of the soft tissue will reveal why, with some of our present impression techniques, we are unable to *maintain* this initial stability. The study of the components of soft tissue will also answer the controversial question concerning the compressibility of tissue.

Science teaches us that liquids and solids are not appreciably compressible except under enormous loads. It is a known fact that all tissue is composed solely of liquids and solids. The predominant and more compressible component of soft tissue is water. Therefore, if we cannot compress the weaker component by prosthetic stresses, then we most certainly cannot compress the more resistant whole. Mathematically, this may be expressed as follows:

The coefficient of the compressibility of water at 37 degrees centigrade, which is body temperature, is 47 x 10 to the minus 6 power. This means that the equivalent of one atmosphere of pressure, 14.7 pounds, would compress one cubic inch of soft tissue a maximum of .000047 of its volume, and this tissue could be far softer than any we shall ever see. A maximum functional denture load is about 25 pounds per square inch. This pressure would, therefore, compress one inch of the softest tissue, a maximum of .000070 of its volume only. This is negligible.

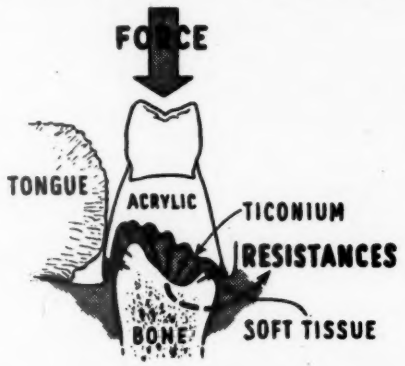
The prosthetic inferences from these facts are:

1. No distinction need be made between hard and soft tissue. Therefore, no different treatment is necessary in taking the impression regardless of whether the base area is soft or hard.
2. If pressure or no pressure is used in taking the impression, stability is obtained *whenever* the base is in uniform contact with the tissue.
3. We can discard the theory of, and such terms as, masticating and functional tissue position, inasmuch as they apply to any position where tissues have uniform contact with the base.



Tissue resolves itself into two main components; water and solids. Water is the predominant and more compressible. Illustration shows the degree of incompressibility of even this weaker component of soft tissue and the natural rigidity of volume of soft tissue.

Once tissue is uniformly contacted by the denture base, external force is exactly counterbalanced by internal tissue resistances in all directions in accordance with Pascal's Law. This applies regardless of tissue form or position. Soft tissue takes on an artificial rigidity of form to supplement its natural rigidity of volume.



Prosthetic practice itself bears this out. Given the same case, operators who use pressure and those who do not will obtain identical stability, Pascal's Law will only apply when the base is in uniform contact with the tissue. This is also true, whether the tissues are forcibly made to contact the base uniformly or whether the base is made to be an exact negative of the tissues in their natural, passive position.

It should now be apparent that our problem is not *obtaining stability* but *maintaining* it.

While soft tissue is predominantly liquid and Pascal's Law does apply to it, it is not a true liquid and has certain characteristics of its own. For example, unlike a liquid, it is enclosed in its own relatively strong mucous membrane and is fastened to the periosteum or bone. Unlike a true liquid, it has a relatively permanent and individual shape and will not therefore, casually accept any shape imposed upon it.

Histology teaches us that the mucous membrane lining the mouth cavity is composed of a layer of stratified squamous epithelium supported upon a tunica propria. The tunica propria is composed of a coarse network of white and *elastic* connective tissue fibres.

In the study of the tunica propria, we see the reasons why we are frequently unable to maintain the initial stability. Tissue as we have said is predominantly water. Water is liquid, and liquids are one of the two perfect elastics known to science. Elasticity does not mean the ability to stretch, but, the ability of a body to resume its former shape after the distorting stresses are removed. Tissue also possesses the important quality of life, and being elastic in addition, will consequently, absolutely refuse to remain passive in an abnormal position, instead, it will fight to recover its normal form. When the tissue returns to its normal form, the base is unseated, is then not in uniform contact, and we have a subsequent loss in stability.

Since, so far as stability is concerned, the position of the tissues is immaterial when uniformly contacted by the denture base; and, since the whole problem is one of stopping distorted tissue from returning to normal form and, thus, unseating the appliance; and, since the only position from which tissue makes no attempt to return to normal is an already normal position, we can only conclude that lasting stability demands an impression and denture base that are absolutely accurate negatives of ridge tissues in their normal passive form. This is the Page Mucostatic Principle and it has never failed to produce a stable denture base.

Glen Lyon, Pennsylvania

Muscle Trimming

AND THE MUCOSTATIC PRINCIPLES

By WILLIAM R. DYKINS, D.D.S.

It has been the objective of all muscle trimming procedures, whether they are achieved by the operator's manipulation of the musculature or by patient gymnastics, to provide a denture periphery which will be released from the functioning border musculature. It could also be added that muscle trimming is performed in impression taking to secure a peripheral seal, harmonious with the denture perimeter.

Since it has been explained in a previous article (TIC, June '43) that atmospheric pressure has no retentive value, we can disregard muscle trimming from the retentive viewpoint.

So far as release of denture borders from functioning musculature by muscle trimming is concerned, dentists have overlooked the physiological fact that there are no muscles on the ridge, while all tendons attach, not in the ridge mucosa but in the periosteum or bone. Thus they have no effect on the ridge surfaces and all ridge tissue is passive under normal function.

The dentist has been and still is misled in what he sees happening in relation to muscles and ridge tissues when the mouth is opened, and he proceeds to tug and distend the cheek and lip muscles. For instance, he observes what appears to be the Buccinator muscle

activating almost to the crest of the ridge height. Again he is misled when he observes what he thinks is happening in those badly broken down ridges in the Mylohyoid area when the tongue is thrust from side to side. It appears that the action of the Mylohyoid muscle continues on and above the Mylohyoid ridge.

Since anatomical text books teach that there are no muscles on the ridge, the answer to what we think we observe lies in the elementary fact that *all* tissue is integumentary. This characteristic of tissue is analagous to a liquid—that is, unless the whole mass can move, none can move. Consequently, tugging on the lip and cheek or thrusting the tongue from side to side simply disturbs the ridge tissues as well as giving the illusion that muscle action extends on to the ridge area.

Since there are no muscles on the ridge, it should be apparent that in normal function, this illusive tissue movement does not exist.

The noxious result of this manual muscle trimming is that some of the ridge tissue is displaced from its natural position. Consequently, when the impression material hardens, this misplaced tissue cannot return to its natural position and form. In previous articles, the baneful effects of this misplaced tissue have been discussed and to repeat them would be tiresome reiteration.

An impression, predicated upon the Mucostatic Principles as formulated by Harry L. Page, is taken with all musculature completely relaxed, and, sequentially the tissue is allowed to remain in its natural, contented position. When this type of an impression is obtained, it is quite surprising to note that the frenum attachments are visible, even though no muscular movement was created.

Inasmuch as muscle trimming is the theme of this article, it naturally leads us to discuss flange extensions and outline.

It should be recalled that the prime purpose of a Mucostatic impression is to obtain a facsimile of the ridge tissues in their natural form. With present day methods and materials, it is an impossibility to obtain this facsimile as well as determine the bone width by muscle trimming. This is so because the only materials we have which are capable of registering true negative, static, ridge tissue demands the use of a tray. The edge and bulk of the tray will present a resistance to functioning musculature regardless of how it is tailored. As a consequence, this resistance to muscle function will disturb the ridge tissues.

It has been stated and "proved" that stability is predicated upon the premises that all tissue is incompressible, and, conjointly, upon Pascal's Law and its supplemental facts and corollaries. Therefore, tissue which is not afforded bony support cannot sustain a load since Pascal's Law can apply only to those soft tissues which are supported on one side by bone and a uniformly contacting base on the oral side.

The inescapable conclusion is that flange extensions beyond the bone width have no value as far as sustaining a load is concerned.

In the Mucostatic impression, the osseous landmarks are not completely visible. The best that can be done

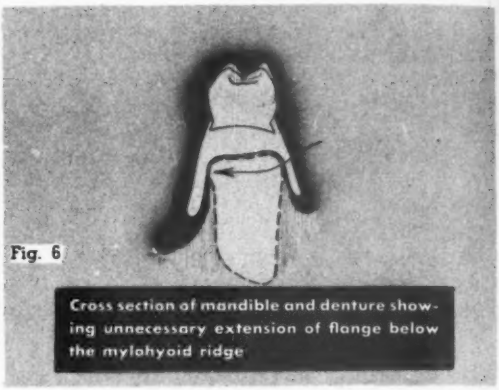


Fig. 6

Cross section of mandible and denture showing unnecessary extension of flange below the mylohyoid ridge

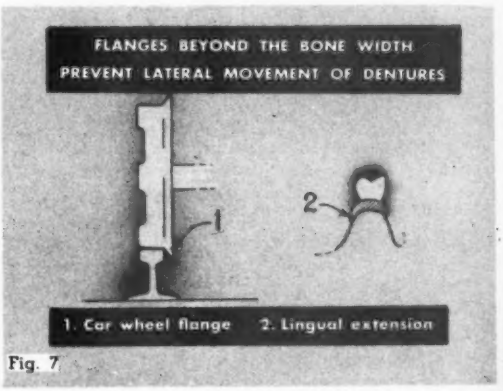


Fig. 7

Illustrations repeated from November, 1942 TIC

in determining the bone widths is to use the known regional averages. The outline is pencilled on the impression or cast with the necessary mutations compatible to the demands of the case, i.e., frenums and abnormalities. It is surprising how close these measurements will approach the desired functional widths.

The railway car wheel is a simple comparison in portraying the value of flange extensions. With the car wheel, it is the railhead which provides the bearing for the load. The flange is extended only far enough to retain the wheel on the track.

It is precisely the same in the lower denture. The base should cap the ridge width and the depth of the lingual flange should be sufficient to prevent lateral skid. Generally a millimeter or two will be adequate. Where the ridge width cannot be matched by the base, for example, frenum cutouts, stability and retention will not be the least impaired, provided the base is an exact duplicate of the ridge tissues in their natural passive form.

All this encourages the belief in the Mucostatic Principle.

39 East Main St., Glen Lyon, Pa.